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(71) Applicants:
• **Chierighini, Maurizio**
37122 Verona (IT)

• **Baldo, Fulvio**
38060 Cimone (Trento) (IT)

(72) Inventors:
• **Chierighini, Maurizio**
37122 Verona (IT)
• **Baldo, Fulvio**
38060 Cimone (Trento) (IT)

(74) Representative: **Coloberti, Luigi**
Via E. de Amicis No. 25
20123 Milano (IT)

(54) Automatic storage unit for waste collection skips

(57) An automatic unit for the storage of waste collection skips (11A-11C) into a pit (10). The unit comprises a pit (10) defining a storage space, and an automatic conveying system for moving skips (11A-11C) along a storage path, inside the pit (10). The conveying system comprises at least first and second elevators (12, 13) each one provided with guide tracks (20A-20C) defining the storage path for the support and moving of the skips

(11A, 11C) to be positioned and aligned on several storage levels. A horizontal translation system (23'), at each storage level of the tracks (20A-20C), co-operates in a controlled manner with the elevators (12, 13) to perform selective movements and recirculation of the skips (11A-11C), as well as to allow the partial or total exit of a skip (11A, 11C) in a predetermined pick-up zone at the open-top side of the storage pit (10).

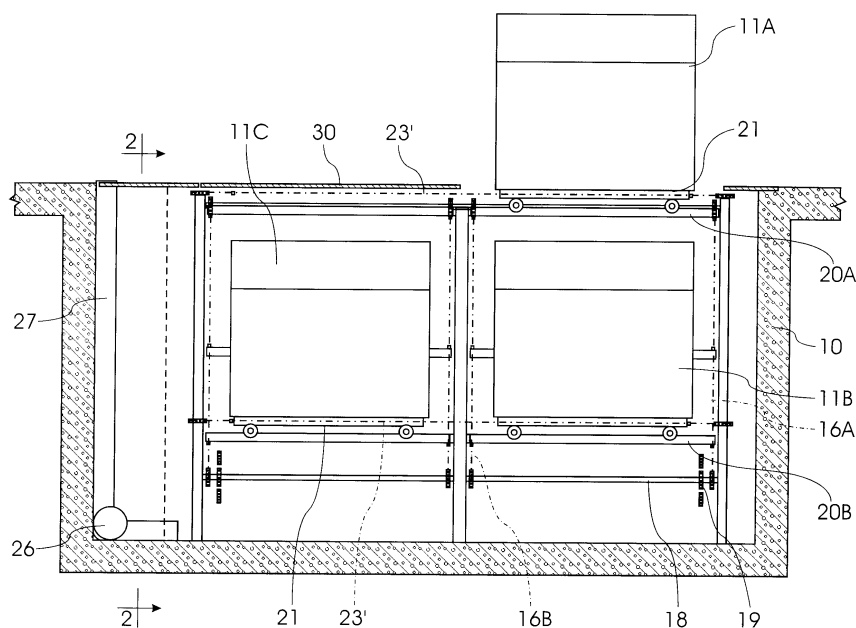


Fig. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the collection of solid urban waste and more specifically to an automatic unit for the storage in a pit of the usual skips or containers for collection of waste, or of specially dedicated containers.

[0002] As is known, solid urban waste is collected in special skips simply placed on the ground, in yards or specially allocated areas.

[0003] All this entails problems of space consuming and visual impact particularly in large residential areas, as well as environmental problems due to the pollution and decay which the improper use of the skips normally involves, in addition to those of a hygiene nature due to the unpleasant smell emitted and to the dirt which accumulates on the ground.

[0004] Moreover, the arrangement of the skips in special spaces inside buildings would make the access for the transport and/or automatic emptying vehicles difficult if not impossible.

[0005] Another inherent disadvantage in the conventional use of waste collection skips consists in the need and difficulty of performing repeated manoeuvres with the vehicle for emptying the skips, in order to align it and pick up each individual skip to be emptied.

OBJECTS OF THE INVENTION

[0006] The general object of the present invention is to provide an automatic storage unit for the storage in a closed area of skips for the collection of solid urban waste, which is suitable for solving or substantially reducing the problems specified above.

[0007] A further object of the present invention is to provide an automatic storage unit for waste collection skips, as referred above, which allows the conservation and storage of the skips out of sight, in a specially dedicated space, easily accessible to any transport means or for emptying the same skips, also allowing the picking-up of the individual skips to be emptied, in a single predetermined position of the storage area.

[0008] Yet another object of the invention is to provide an automatic storage unit for skips, as referred above, which is suitable for considerably limiting the hygiene problems and environmental impact, such as to allow totally automatic management with the various skips appropriately hidden in an especially equipped space, enabling the various skips to be recirculated and filled progressively, leaving on each occasion one single skip outside and accessible for normal use.

BRIEF DESCRIPTION OF THE INVENTION

[0009] The above can be achieved by an automatic storage unit for the storage of skips for the collection of

solid urban waste according to the claim 1.

[0010] More specifically, according to the invention, an automatic storage unit is provided for the storage of skips for the collection of waste, comprising:

- an open-top pit in the ground, defining a skip storage space having a longitudinal axis parallelly arranged to a ground surface; and
- an automatic skip conveying system for moving the skips along a storage path inside the pit;

the conveying system comprising:

- at least first and second skip elevators side by side arranged along the longitudinal axis of the pit, each elevator provided with horizontally extending guide tracks defining the storage path for movably supporting the stored skips, the guide track of the elevators being longitudinally alignable at different storage levels inside the pit, and near the open-top side of the same;
- a draw system for moving and positioning each single skip at each storage level on the elevators; and
- control means for selectively controlling the skip elevators and each drawing system to circulate the waste collecting skips along the storage path inside the pit, as well as to allow at least a skip to protrude in respect to the ground surface at a location of the open-top side of the skip storage pit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] These and further features of the automatic storage unit for storing skips for the collection of solid urban waste, according to the invention, will be made clearer by the following description with reference to the accompanying drawings, in which:

- Fig. 1 is a longitudinal sectional view of a first embodiment of an automatic storage unit for skips according to the invention;
- Fig. 2 is a cross sectional view along line 2-2 of figure 1;
- Fig. 3 is a top view of the automatic storage unit of figure 1;
- Fig. 4 is a diagram illustrating an elevator and drawing system for moving and recirculation of skips in a storage unit according to the embodiment of figure 1;
- Fig. 5 shows an enlarged detail of figure 4;
- Figs. 6 to 9 show diagrams illustrating the recirculation of the various skips, according to a further embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0012] As shown in the figures from 1 to 5, according to a first embodiment, an automatic storage unit for the storage of skips for the collection of solid urban waste, according to the present invention comprises a pit 10 defining a large space in the ground for storage of several skips 11A, 11B, 11C, one of which, for example the skip 11A, normally remains raised in a condition of use, with the skip partially or totally outside protruding from the open-top side of the pit 10, while the other skips 11B and 11C remain lowered in a stored condition totally inside the pit 10, as schematically shown in figure 1.

[0013] Inside the pit 10 an elevator system is provided for raising, moving and positioning the skips 11A, 11B, 11C along a storage path, and which automatically provides for their vertical and horizontal movements along appropriate guide tracks for supporting and moving the skips, as explained hereinbelow.

[0014] As shown in figures 1 to 4, an elevator and skip conveying system, schematically shown in its basic elements, allows the possibility of performing a recirculation of the skips 11A, 11B, 11C, along a recirculation path inside and outside the pit 10 so that individual empty or full skips can be taken at the level of the ground surface, in a predetermined position or zone of the top-open side of the pit 10 for their filling or emptying, or stored and kept at one or more levels in the pit 10 after their filling or emptying, in order to be subsequently returned outside for their use or when the full skips have to be taken by an appropriate vehicle or removed for their emptying.

[0015] More specifically, the elevator system for raising and moving of the skips, according to the preferred embodiment example of figure 4, comprises a first chain elevator 12, as well as a second chain elevator 13 adjacent to and aligned with the previous one along the longitudinal axis of the pit 10, for the raising and lowering of the skips 11A, 11B, 11C. Each elevator 12, 13, on both sides of the pit 10, is provided with a set of tracks 20A, 20B for the guide and the support of the skips which can be moved and positioned on several levels, as well as with guide rails 22, drive motor 14 and a control system 28 for raising, lowering, positioning and of stopping of the guide tracks 20A, 20B supporting the skips 11A-11C at the various storing levels.

[0016] In the case shown in figure 4, the control system for positioning and stopping the tracks 20A, 20B, comprises a cam member 15 connected to a drive shaft 18 of the elevator; the cam 15 actuates a microswitch 15' connected to an electrical circuit or to a control unit to stop the drive motors 14 of the elevators each time the tracks 20A, 20B reach the required storage levels. As an alternative to the cam control system 15, 15' any other suitable control means can be provided, for example a signal generator or encoder driven by the rotation of a shaft 18 of the elevator.

[0017] More specifically, each elevator 12 and 13 comprises four endless chains 16A, 16B, 16C, 16D

which develop vertical along respective vertical paths from the bottom of the pit 10 upwards near both side walls of the same pit 10, winding around pairs of cogged wheel 17. Each cogged wheel 17 of the chains at one end of each elevator 12, 13 is in turn connected to a corresponding cogged wheel 17 on the opposite end chains, via a drive shaft 18. The four endless chains 16A-16D at the ends and on the two sides of each elevator are synchronised one with the other to conjointly move in any appropriate manner, for example by means of an endless chain 19 which extends crosswise between cogged wheels connected to the lower drive shafts 18, one of which is connected to the electric motor 14 by an intermediate transmission member or chain schematically denoted by 14A.

[0018] Again, from the diagram of figure 4, it can be noted that each elevator 12 and 13 comprises several pairs of horizontal tracks 20A, 20B and 20C, connected to the endless chains 16A-16D, which extend longitudinally to the pit 10 and along which trolleys 21, shown in figure 1, can slide to support and move the skips 11.

[0019] Furthermore, the endless chains 16A-16D, during lowering or raising movements, are guided by means of vertical rails 22, one of which is shown by way of an example in the detail of figure 5. The rails 22 extend parallel to the chains 16A-16D preventing the tracks 20 for supporting the skips from oscillating, and consequently the same skips from hitting against the side walls of the pit 10.

[0020] The elevator 13 is wholly similar or identical to the elevator 12 where to reference should be made for its description.

[0021] The elevator system for moving the skips, in addition to the vertical elevators 12 and 13, also comprises horizontal draw means for moving the skips along the tracks 20A-20C of both elevators 12 and 13 inside the pit 10, when the tracks 20A-20C of an elevator 12 are aligned with the corresponding tracks 20A-20C of the other elevator 13.

[0022] As shown in figure 4, the draw means for the trolleys 21 are provided at each storing level of the tracks. In the example shown they comprise an endless chain 23' on one side of the pit 10 which horizontally extends over the length of the two adjacent elevators 12 and 13, between two cogged wheels 23, one of which is connected to an electric motor 24 by an intermediate chain. Each chain 23' is provided with one or more pushing members 25 which engage one end the trolleys 21, or alternatively directly the skips 11A-11C should the latter be provided with their own wheels, in order to move the individual skips 11-11C from one storing position to another storing position along the storing path provided by tracks 20A-20C between the two elevators 12, 13.

[0023] In this case too an appropriate cam control device wholly similar to the cam control device 15, 15' of the two vertical elevators, or a signal generator can be provided to determine the positions for stopping the skips 11A-11C on the tracks 20A-20C of the two eleva-

tors 12, 13.

[0024] Both elevators 12, 13 with the chains 23' of the draw system for vertical and horizontal movements of the skips, are carried by a support structure inside the space of the pit 10, in a suitable position for allowing cleaning and maintenance of the pit itself. Moreover the latter is to be provided with an air suction system comprising a fan 26 designed to suck the air inside the pit in order to convey it towards the exterior by means of a pipe 27.

[0025] 28 in figure 3 also denotes a cabinet or any other electrical control panel, near a zone 29 for accessing to the pit 10.

[0026] The upper side of the pit 10, at each elevator 12, 13, can in turn be closed by a cover, for example of the tip-up type, as schematically denoted by 30 in the figures of the accompanying drawings.

[0027] The functioning of the automatic storing unit for storage of skips is briefly the following: in the example shown, the storing unit allows storage of three skips, including an external skip 11A in use condition for collecting waste, and two skips 11B, 11C inside the pit 10, which may be empty or full according to the degree of use of the system.

[0028] The individual skips 11A, 11B, 11C are then rested on the trolleys 21 moving along the tracks 20A, 20B, 20C of the two elevators 12, 13, for example the tracks 20A and 20B inside the endless-chains 16A-16D in the case of figure 4, so that they can be moved both vertically and horizontally. In particular, the vertical movement of the trolleys 21 supporting the skips, can be driven in a reversible manner both from above downwards and in an opposite direction, between a raised position, for example denoted by 11A in figure 1, wherein the skip projects partially or totally from the pit 10 to allow its use, and a lowered position denoted by 11B in the same figure 1, wherein the skip, full or empty, is stored inside the pit 10.

[0029] At the various alignment levels of the tracks 20A-20C of the two elevator 12, 13, the trolleys 21 with the respective skips can then be laterally moved, or reciprocate from one elevator to another, by means of the draw devices 23'. In this way it is possible to perform a cyclical rotation of all skips 11A, 11B, 11C along the conveying path, between a stored condition inside the pit 10, to an use condition, bringing them subsequently at the level of the ground surface for waste collection and respectively for emptying the skips themselves.

[0030] In the example of the accompanying drawings, an elevator system for the skips has been shown of the endless chain type, in that it allows an extremely simple solution, with less problems of maintenance. However, in substitution of the chain elevators shown, it is possible to use any other elevator device for rising the skips, providing, for example, special platforms mechanically, hydraulically or differently actuated moving along vertical guides.

[0031] In the case of figures 1 to 5, the storage unit is

set up to contain the skips on one single level inside the skip 10.

[0032] In the cases wherein it is necessary to have many skips, it is possible to use a higher number of adjacent elevators, extending the pit along its longitudinal axis where possible, or increasing its depth in order to arrange the skips on two or more storage levels for each elevator, inside the pit itself.

[0033] This latter solution is shown in the illustrative diagrams of figures 6 to 9 where the pit 10 has been represented without the moving systems for the skips, which are wholly similar to those described previously; the various storing positions are also shown by the five skips A, B, C, D and E according to the recirculation layout represented therein.

[0034] In brief, figure 6 shows the pair of skips A and B of the first right-hand elevator, in a raised position, at a first level in which the skip A partially projects from the pit 10 for its use, and the skip B is stored at an intermediate level inside the pit; skip E is positioned at the same level of skip B, while skips C and D are positioned at a bottom level.

[0035] When the skip A has been completely filled, an operator, by means of a control panel, not shown, starts up the automatic cycle for replacing a full skip A with a new empty skip.

[0036] Therefore, as shown in figure 7, the two skips A and B are conjointly lowered, then the skip B on the right-hand elevator is moved below the skip C on the central elevator, as shown in figure 8. Subsequently the full skip A is lowered further, thus transferring the empty skip C from the central elevator to the right-hand one, at the same time transferring the empty skip E from the left-hand elevator to the central one, as shown in figure 9.

[0037] At this point the skips C and A on the right-hand elevator can be raised to bring the skip C partially or totally outside of the pit 10, in the same condition as the skip A of figure 6, wherein the empty skip can once again be used.

[0038] When the full skips have to be picked up for emptying, a substantially similar procedure is adopted, making the various skips circulate inside the pit 10, until taking them individually into the same position as the skip A of figure 6 where they can easily be picked-up by a vehicle for emptying, without the vehicle having each time to carry out special manoeuvres, in that the position of picking up and depositing the skips remains substantially unchanged.

[0039] Therefore, what has been said and shown with reference to the accompanying drawings has been given purely by way of an example of the general principles of the present invention.

[0040] Therefore other changes or variations may therefore be made either to the hoisting system or to that of translation of the skips, both as regards the shape and size of the storage pit, and to the number of skips used, without thereby departing from what is claimed.

Claims

1. Automatic storage unit for the storage of skips (11A-11C) for the collection of waste characterised by comprising:

- an open-top pit (16) in the ground, defining a skip storage space having a longitudinal axis parallelly arranged to a ground surface; and
- an automatic skip conveying system (16A-16D; 20A-20C; 23') for moving the skips (11A-11C) along a storage path (20A-20C) inside the pit (10);

the conveying system comprising:

- at least first and second skip elevators (12, 13) side by side arranged along the longitudinal axis of the pit (10), each elevator (12, 13) provided with horizontally extending guide tracks (20A-20C) defining the storage path for movably supporting the stored skips (11A-11C), the guide tracks (20A-20C) of the elevators (12, 13) being longitudinally alignable at different storage levels inside the pit (10), and near the open-top side of the same;
- a draw system (23', 24) for moving and positioning each single skip (11A-11C) at each storage level on the elevators (12, 13); and
- control means (15'- 28) for selectively controlling the skip elevators (12, 13) and each drawing system (23', 24) to circulate the waste collecting skips (11a-11C) along the storage path (20A-20C) inside the pit (10), as well as to allow at least a skip (11A-11C) to protrude in respect to the ground surface at a location of the open-top side of the skip storage pit (10).

2. Automatic storage unit for the storage of skips (11A-11C) according to claim 1, characterised in that each elevator (12, 13) is provided with an independent drive motor (14).

3. Automatic storage unit for the storage of skips (11A-11C) according to claim 2, characterised in that each elevator (12, 13) comprises control means (15, 15') to stop the tracks (20A-20C) for supporting the skips (11A-11C), in axially aligned positions, at each storage level of the elevators (12, 13).

4. Automatic storage unit for the storage of skips (11A-11C) according to claim 1, characterised by comprising an air suction device for sucking air from the inside of the pit (10).

5. Automatic storage unit for the storage of skips (11A-11C) according to claim 1, characterised by comprising a removable cover (309) extending over at

least part of the open-top side of the storage pit (10).

6. Automatic storage unit according to claim 1, characterised in that said skip elevators (12, 13) are of the endless chains type (16A-16D).

7. Automatic storage according to claim 1 and 6, characterised in that each skip elevator (12, 13) comprises first and second endless chains (16A-16D) on both side of the pit (10), said guide tracks (20A-20C) being movably supported by said chains (16A-16D); and control means (19) to operatively connect the endless chains (16A-16B) and conjointly move the guide tracks (20A-20C) on both side of the same elevator (12, 13).

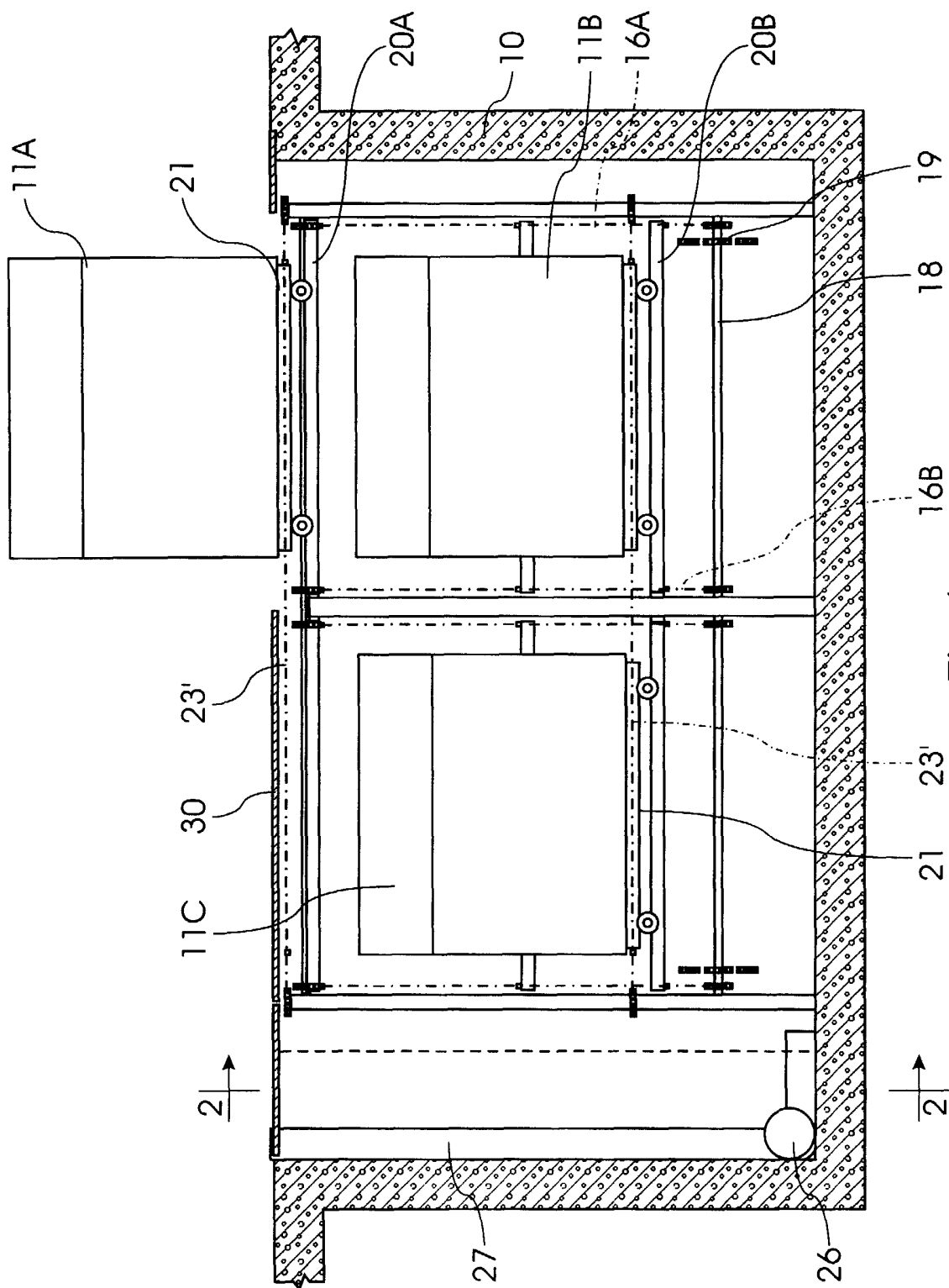


Fig. 1

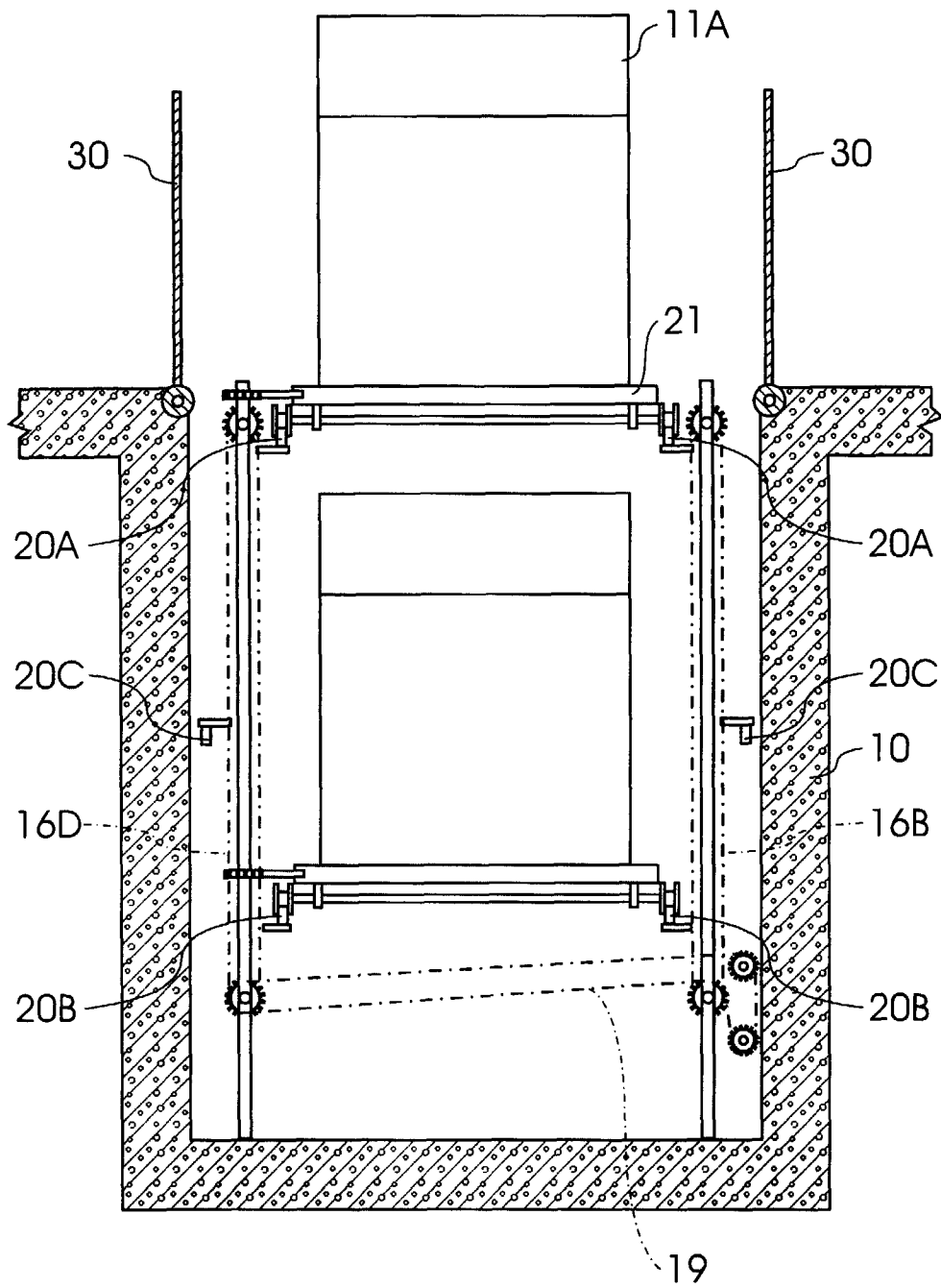
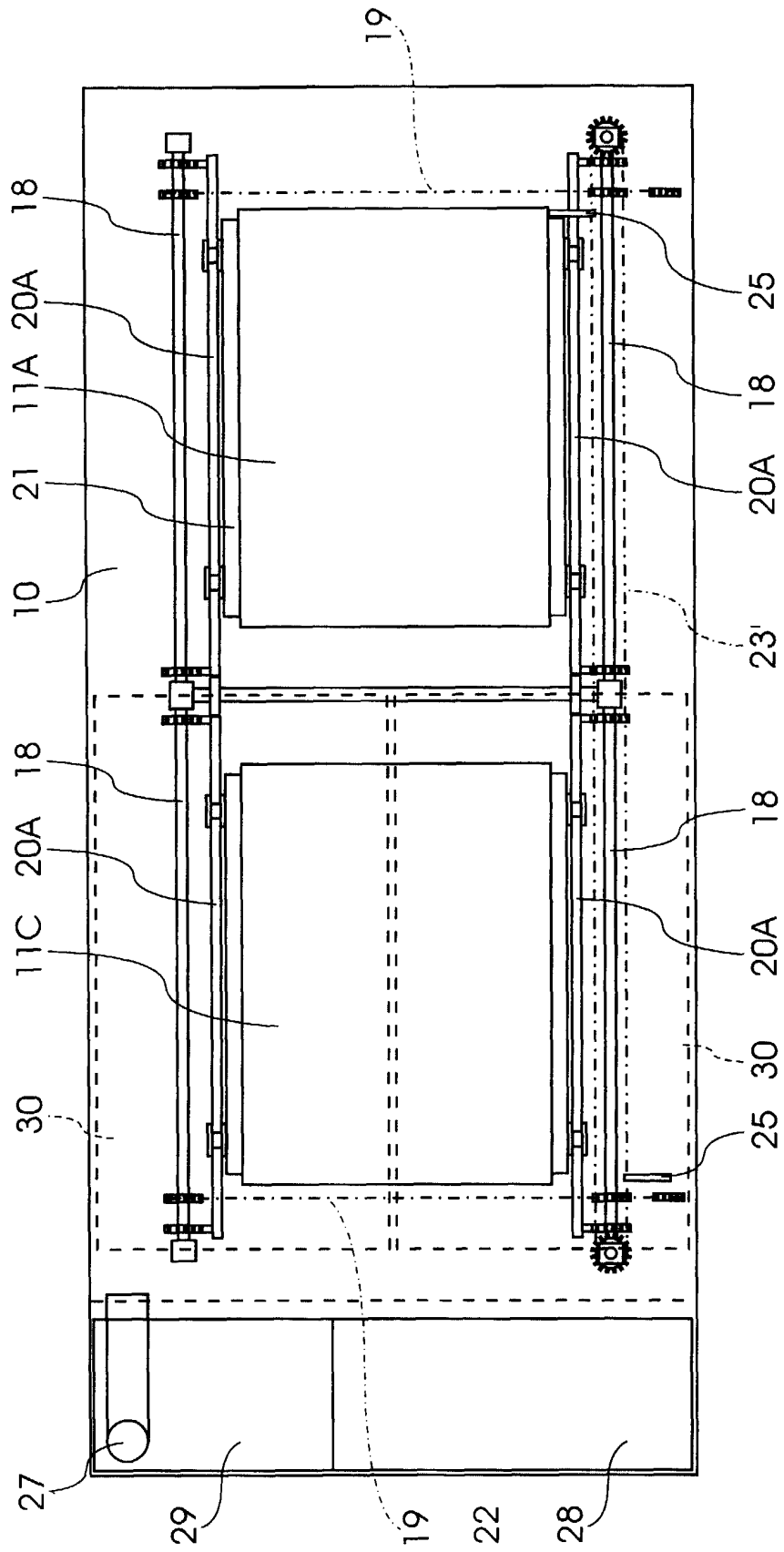


Fig. 2



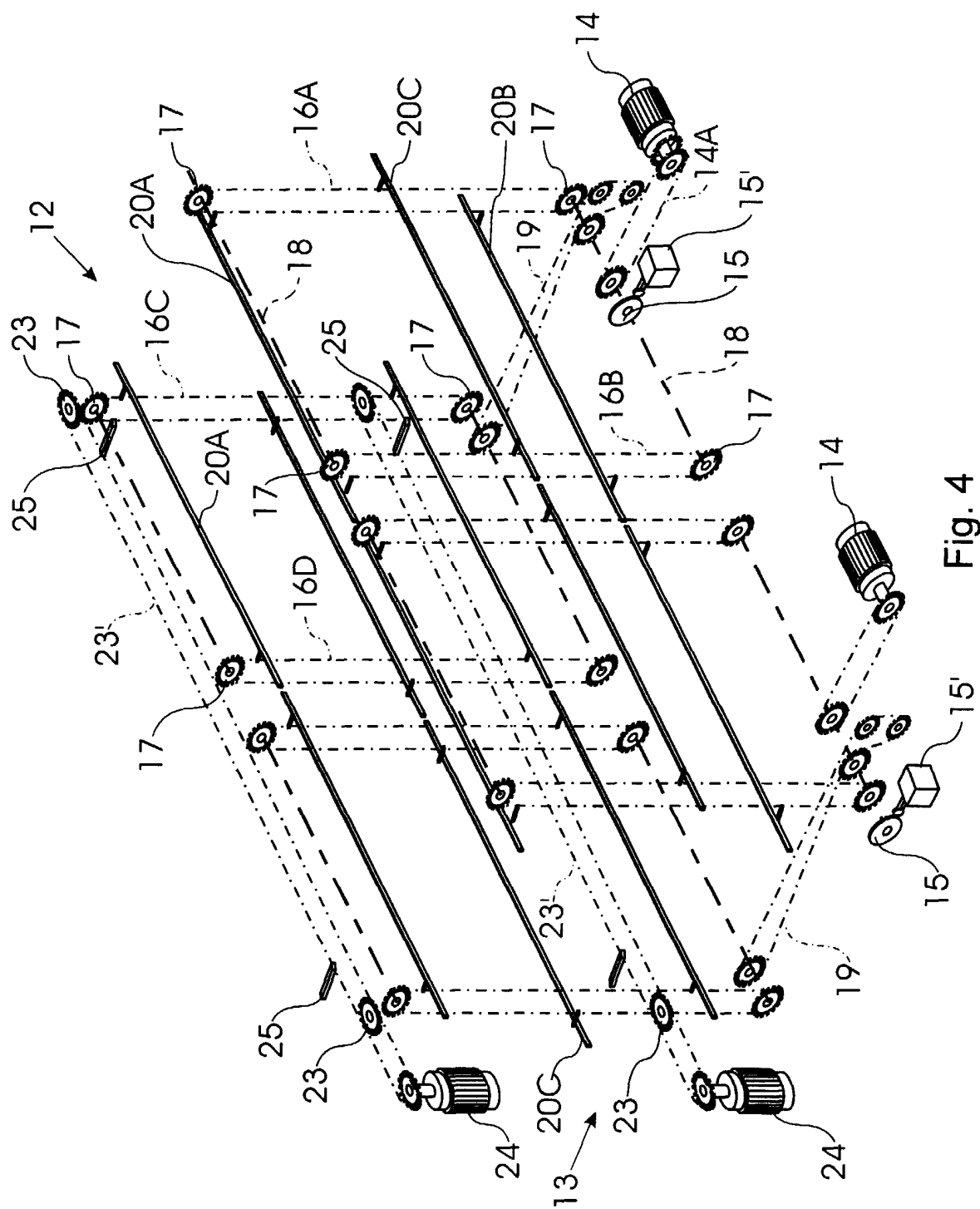


Fig. 4

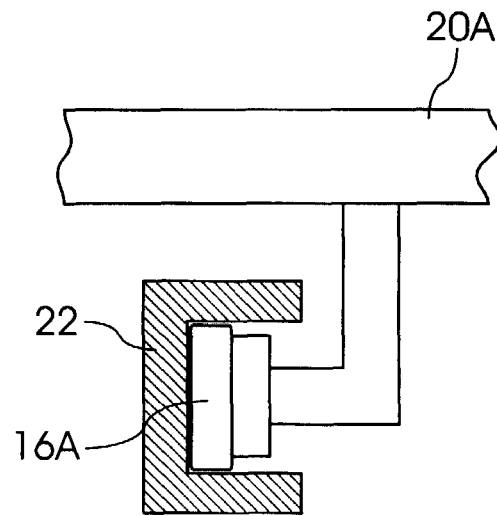


Fig. 5

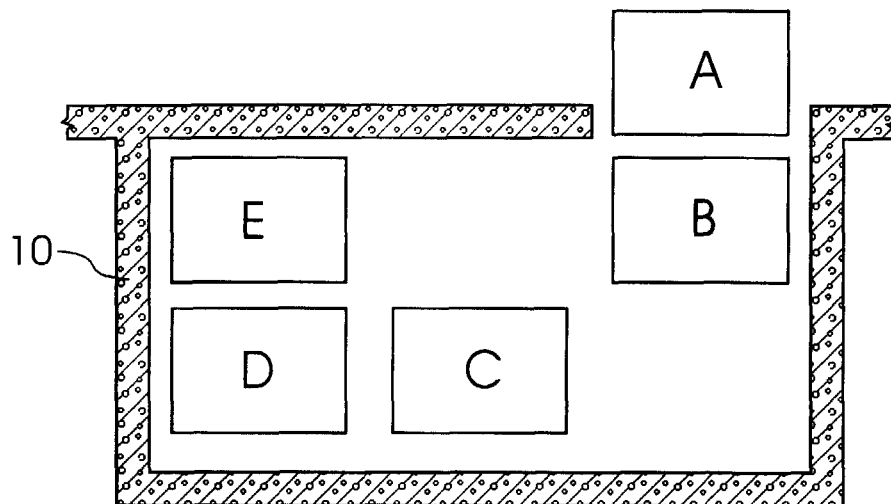


Fig. 6

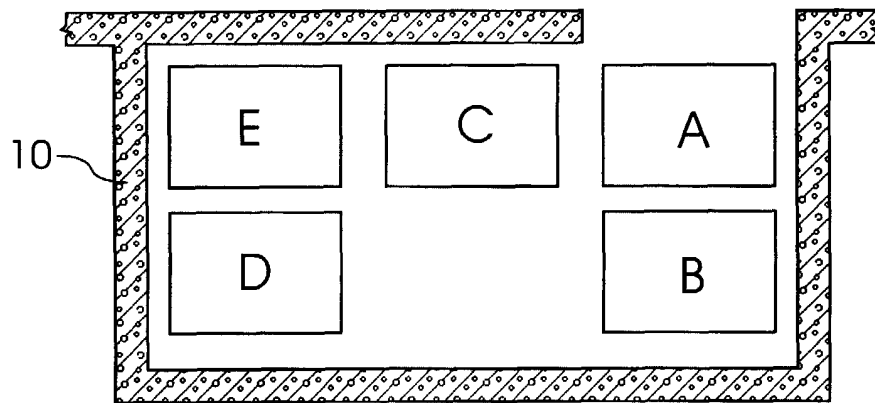


Fig. 7

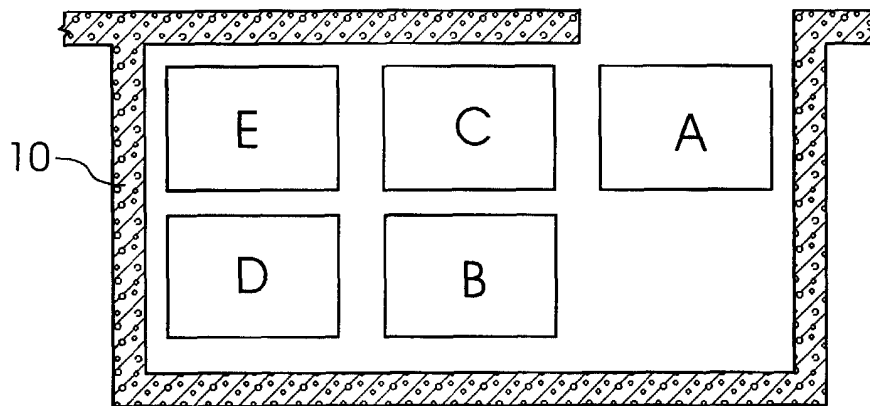


Fig. 8

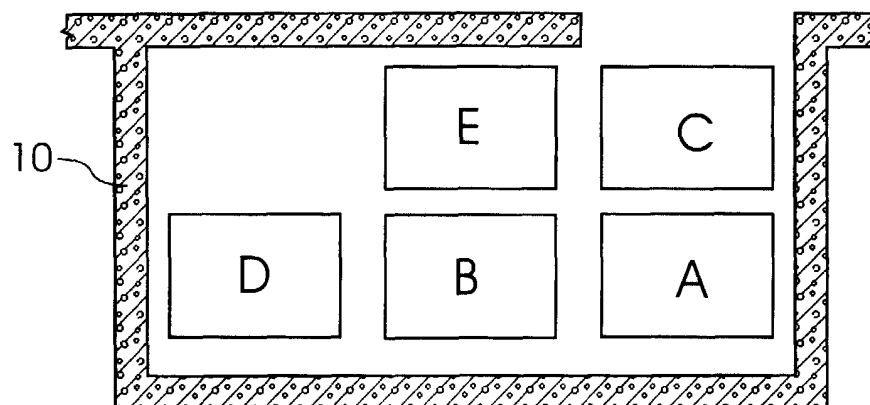


Fig. 9



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EUROPEAN SEARCH REPORT

Application Number
EP 99 11 3707

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	DE 93 07 149 U (J. KOHLERT) 7 October 1993 (1993-10-07) * the whole document *	1,7	
A	DE 295 20 262 U (HAGEN BETON-ABBAU GMBH) 28 March 1996 (1996-03-28) * page 5, line 5 - page 10, line 15 * * figures 1-6 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 6 October 1999	Examiner Smolders, R
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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06-10-1999

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